CLAIMS

What is claimed is:

1. A synthetic aperture system for producing a spatially non-periodic pattern in a region of overlap comprising:

a source of electromagnetic radiation producing a plurality of electromagnetic beams;

a plurality of beam controllers positioned to receive a respective one of said plurality of said electromagnetic beams and direct said respective electromagnetic beam into said region of overlap; and

a system controller in electrical communication with each of said plurality of said beam controllers,

wherein each beam controller controls at least one of the phase, amplitude and polarization of a respective one of said plurality of electromagnetic beams in response to control signals from said system controller, and

wherein a spatially non-periodic pattern is formed within said region of overlap by the interference of said plurality of electromagnetic beams in response to said control signals from said system controller.

2. The system of claim 1 further comprising a source controller in electrical communication with said system controller and said source of electromagnetic radiation wherein said source controller controls the amplitude of each of said plurality of electromagnetic beams as a function of time in response to said control signals from said system controller.

3. The system of claim 1 wherein said source of electromagnetic radiation comprises:

a laser producing an electromagnetic beam; and

a beam splitter device positioned to receive said electromagnetic beam and produce said plurality of electromagnetic beams therefrom.

4. The system of claim 1 wherein one of said beam controllers comprises an acoustic diffractive device.

5. The system of claim 4 wherein one of said beam controllers comprises an acousto-optic modulator.

6. The system of claim 1 further comprising a field stop adjacent to said region of overlap wherein said field stop limits a spatial extent of said spatially non-periodic pattern.

7. The system of claim 1 further comprising an apodizing element for at least one of said plurality of electromagnetic beams wherein said apodizing element limits a spatial extent of the at least one electromagnetic beam.

8. The system of claim 1 further comprising a receiver to receive said spatially non-periodic pattern.

9. The system of claim 8 wherein said receiver comprises a photosensitive chemical receiver.

10. The system of claim 8 wherein said receiver receives a plurality of said spatially non-periodic patterns.

11. A method for producing a spatially non-periodic pattern in a region of overlap comprising the steps of:

providing a plurality of electromagnetic beams;

directing said plurality of electromagnetic beams into said region of overlap; and

modulating at least one of the phase, amplitude and polarization of at least one of said plurality of electromagnetic beams to thereby form a spatially non-periodic pattern in said region of overlap by the interference of said plurality of electromagnetic beams.

12. The method of claim 11 wherein the step of modulating at least one of the phase, amplitude and polarization of said at least one of said plurality of electromagnetic beams comprises the steps of:

providing an acoustic diffractive modulator; and

modulating said electromagnetic beam using said acoustic diffractive modulator.

13. The method of claim 11 wherein said step of providing said plurality of electromagnetic beams comprises the steps of:

providing a source of an electromagnetic beam; and

splitting said electromagnetic beam into a plurality of electromagnetic beams.

14. The method of claim 11 further comprising the steps of:

providing a substrate;

providing a layer of photoresist at said substrate; and

exposing said photoresist to said spatially non-periodic pattern.

15. The method of claim 14 further comprising repeating said steps of modulating and exposing to generate a predetermined pattern in said layer of photoresist.

16. The method of claim 11 further comprising the step of calibrating said interference prior to forming said spatially non-periodic pattern.

17. The method of claim 11 further comprising the step of calibrating said interference during generation of said spatially non-periodic pattern.

18. The method of claim 11 further comprising the step of apodizing said spatially non-periodic pattern.

19. A synthetic aperture system for producing a spatially non-periodic pattern in a region of overlap comprising:

a source of electromagnetic radiation producing an electromagnetic beam;

a beam controller positioned to receive said electromagnetic beam and generate a plurality of output beams; and

a system controller in electrical communication with said beam controller,

wherein said beam controller controls at least one of the phase, amplitude and polarization of at least one of said output beams in response to control signals from said system controller, and

wherein a spatially non-periodic pattern is formed within said region of overlap by the interference of said plurality of output beams in response to said control signals from said controller.

20. The synthetic aperture system of claim 19 wherein said beam controller further comprises a source controller in electrical communication with said source of electromagnetic radiation, said source controller controlling the amplitude of said electromagnetic beam produced by said source as a function of time in response to control signals from said system controller.

21. The synthetic aperture system of claim 19 further comprising at least one beam director positioned to receive a respective one of said plurality of output beams and direct said respective output beam into said region of overlap.